Regional Water Works

Sharing Urban Water Services

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The project began in 2000 and includes the following research components:

- Urban Water Management
- Urban Infrastructure
- Urban Finance
- Urban Regions
- Urban Aboriginal People
- Urban Growth and Affordable Housing
- Marketing Western Cities on the Global Stage
- Municipalities in Federalism
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Executive Summary

As in other parts of the country, urban areas in the West have evolved in an ad hoc fashion. As a result, the West's large city regions are comprised of a hodgepodge of large and small municipalities each with its own government and way of doing things. This means that the municipalities that form the urban regions must find ways to work together if they are to reap the benefits of cooperation and avoid the costs of conflict.

Water services are an excellent example of a municipal policy area that calls for a regional approach. Providing water services such as safe drinking water and wastewater disposal are key functions of municipal governments. Water is critical to both our health and economic prosperity and it is a resource that needs to be carefully managed. Watersheds, however, do not conform to municipal boundaries and there is significant variation in the capacity of municipalities to provide water services. Hence, there is value in working together and adopting regional approaches to water management in urban regions.

The benefits of working together and sharing urban water services are clear: better services at lower cost and more effective regional watershed management. There are, however, significant barriers to realizing these advantages. For example, the benefits of cooperation may not be evenly distributed among large and small municipalities and, therefore, form a barrier to moving forward with regional approaches. There are also political barriers such as competition for economic development as well as other concerns (e.g., environmental factors) that must be addressed for regional cooperation to work.

Regional Water Works provides an overview of the current state of regional water management in six large western Canadian city regions (Vancouver, Calgary, Edmonton, Regina, Saskatoon, and Winnipeg) and outlines the case for sharing urban water services. Drawing on interviews with key stakeholders, the report uncovers a series of practical lessons and proposes a number of recommendations for increasing the amount and effectiveness of regional cooperation in the area of water services.

The degree to which the large western city regions are involved in regional water sharing varies from city to city with Vancouver and Edmonton exhibiting the greatest degree of regional integration. In general, there is significant room for expansion of regional approaches across the West.

Key lessons include: safe drinking water for all residents must be a top priority; regional approaches must make economic sense to be used; shared services can have a significant impact on the environment; provinces have a major role to play in promoting and facilitating regional approaches; meeting new water quality standards is putting pressure on smaller municipalities to seek out partnerships with large cities; financing water infrastructure is a key challenge; and broad, system-wide perspectives are critical to the long-term maintenance of western Canada's watersheds.

The report makes the following recommendations: 1) large cities should be open to exploring the development of shared water services; 2) ensuring the safety of drinking water should be viewed as a shared responsibility; 3) water service sharing agreements should fully account for their environmental effects; 4) water service sharing agreements should account for the full-cost of water services including the long-term replacement of infrastructure and maintenance of watersheds; 5) water conservation mechanisms should be built into water service sharing agreements; 6) formal structures for managing regional systems should be created; 7) provincial governments should become more involved in facilitating regional water systems; and 8) water management and land use planning should occur at both an integrated local level and at the larger regional level.

I. Introduction

Providing water services is a key function of city governments in Canada. An adequate supply of clean water and the disposal of wastewater are critical to the health of a city's residents and to its economic prosperity.

There are two reasons to believe that the management of urban water services will grow more complex in the years ahead. First, cities must manage the effects of population growth and economic development within their own boundaries. Population growth and economic development increase both the demand for water and the load placed on a city's wastewater system. Second, city water systems are affected by population growth and economic development *in surrounding areas*. Water quality in large cities, for example, is affected by activities in metro-adjacent communities such as residential construction projects, runoff from septic tanks, and farm and feedlot operations. At the same time, many metro-adjacent communities are seeking to access the water of large cities because it is of higher quality and/or because they need more water than the local system can provide.

To increase understanding of regional water services in large western Canadian cities, *Regional Water Works: Sharing Urban Water Services* explores three questions:

1. What are the key reasons for, and barriers to, expanding regional water services in the West?

2. How do large western Canadian cities manage water services in a regional context?

3. What are the key lessons of regional water services management in the West?

In this report, regional water services management is viewed from the perspective of intergovernmental relations, and emphasis is placed on finding successful models for intergovernmental management with an eye to the long-term health of the water system. *Regional Water Works: Sharing Urban Water Services* examines the political context of water by considering political barriers to changing water services management, opportunities for improved intergovernmental structures, and how public policy in the area of sharing urban water services can be improved.

By examining the relationships of neighbouring municipalities and water sharing, the report taps into differences in urban and rural water quality and outlines how these might be managed in a way that benefits both the cities and their surrounding areas. Although the scope of the research has been limited to the five large prairie cities and their adjacent communities (with some discussion of the Vancouver area), the research findings should be of interest to large and small municipalities across Canada that are seeking ways to co-manage water resources.

II. Methodology

Regional Water Works: Sharing Urban Water Services is based on a comparative analysis of the five large prairie cities - Calgary, Edmonton, Regina, Saskatoon, and Winnipeg - with additional consideration of Vancouver. These prairie cities were chosen because they are the dominant urban centres in the region and have the infrastructure and population bases to support large water treatment facilities and high water quality standards. Vancouver is unique from the prairie cities in many ways including the nature of the city-region and its watershed. However, to the extent possible, lessons from the Vancouver experience are explored.

Municipal governments play an important role in water management including water treatment, water distribution, wastewater treatment, stormwater management, and the provision of consumer information regarding conservation and quality. Each of these areas is critical, but it is beyond

the scope of this study to cover each of these topics in a manner that does them justice. For this reason, *Regional Water Works* focuses on the municipal services of drinking water and wastewater. This report does not address technical issues related to water treatment and delivery, privatization options, or habitat, wetlands, watershed and recreational water management. However, readers are asked to keep in mind that it is impossible to separate urban water management and water quality from the health of the surrounding basin and the general health of the water system. As a result, efforts to improve water management systems must include consideration of the health of the larger water system.

Research began with a literature review of water issues in western Canada, focusing on urban and urban fringe topics. Government websites and documents were reviewed in order to summarize responsibilities, policies, key legislation and regulations, and other agreements that have an influence over water services management in western Canada's large cities.

To collect information on regional approaches to water services management, 37 elite-level qualitative interviews were conducted between May and September 2003. Interview subjects included key city officials and other individuals involved in water quality management and water research.

Readers should note that, for the purposes of this study, "region" is loosely defined as the geographic area surrounding a core urban municipality (e.g., the City of Regina or the City of Calgary) where shared water and wastewater services between autonomous municipalities and the core urban municipality presently exist or could occur.

III. Who is Responsible for Water Services?

Water services include treating and distributing drinking water, removing wastewater, ensuring water quality meets specified standards, managing the available supply of water, managing the demand for water, allocating water use, protecting water from contamination, ensuring protection of the environment and natural habitats, reclamation of wetlands, flooding and drainage issues, maintaining infrastructure, public education regarding water use, management and conservation, planning for future water uses, and mitigating possible risks to the water supply.

What is often unappreciated by the person turning on the tap is the high level of intergovernmental and jurisdictional complexity regarding water services. The federal, provincial, territorial, and municipal governments, as well as industry and non-governmental organizations, are all involved in ensuring that Canadians have quality water. Rather than having clearly defined and separate roles, there are overlapping responsibilities among jurisdictions that lead to both partnerships and conflicts. In general, the provincial and territorial governments are responsible for providing safe drinking water within their borders, while the federal government is responsible for ensuring safe water within its territory and on First Nations' lands.

Provincial governments have constitutional responsibilities regarding the management of water within their borders. In terms of drinking water and wastewater, these responsibilities include: creating legislation; creating and maintaining standards and guidelines; delivering approvals and codes of practice programs; certification and training of operators; delivering water allocation licensing programs, abatement programs, and compliance programs; grant programs; providing emergency response; providing provincial laboratories for testing drinking water; creating and implementing policies and initiatives to facilitate

management of water and wastewater; and supporting education and information exchange. Most provinces delegate to municipal governments the responsibility of day-to-day delivery of water and wastewater services, as well as various aspects of land use planning and development that can affect water quality.

While provincial governments have the constitutional responsibilities, **municipal governments** typically deliver water services in accordance with provincial legislation. Although there are variations between and even within provinces, municipal governments are responsible for monitoring water quality, treating water and wastewater, running water management facilities, regulating discharges into the water, maintaining infrastructure, and distributing treated drinking water. As well, municipalities are responsible for planning, operating and maintaining stormwater management systems, thus meeting the drainage needs of a community. Municipal ownership and responsibility for water services mean that local governments are publicly accountable (through the electoral process) for the local water system.

The **federal government** is the least directly involved with urban water services, but it does play an important role. There are more than 20 federal acts and regulations that pertain to water. One of its main roles is the protection of fish habitat (and therefore water quality) through Fisheries and Oceans Canada. As well, Environment Canada enforces pollution prevention aspects for water and provides scientific environmental standards and monitoring and sampling protocols. Other responsibilities are carried out by Health Canada, Indian and Northern Affairs, Agriculture and Agri-Foods, Natural Resources, Industry, Foreign Affairs and International Trade, and Public Works.

The federal government also funds research and education programs on water quality issues, provides scientific and technical information on water issues (National Water Research Institute), and conducts environmental assessments for the purposes of environmental protection.

Many of the federal responsibilities are shared with the provinces/territories. Two federal/provincial/territorial committees facilitate the sharing of information and develop guidelines for water safety. The Federal/Provincial Subcommittee on Drinking Water develops national health-based guidelines for drinking water (although provinces are responsible to provide legislation for the actual standards). The Canadian Council of Ministers of the Environment has the Water Quality Guideline Task Group that develops national environmental quality guidelines.

Finally, it is important to note the role of **non-governmental organizations** (NGOs) in water services. While NGOs are not responsible for water services, they do play a critical role in helping to protect and ensure the quality of the larger water system from which local water resources are drawn. Watershed authorities, wetland protection organizations, and conservation groups work with governments and each other to ensure that the health of the watershed or source water is protected. As clean water sources result in less expense and effort for municipal governments to treat water, the contributions of NGOs should not be forgotten.

Overall, in a day-to-day sense, it is municipal governments that are most directly involved with water services. How do municipal governments manage the delivery water services? There are a number of operating models including:

Municipal Department. The municipality operates its own water system directly through the municipal administrative structure (e.g., the City of Calgary's Waterworks business unit).

Municipally-Owned Corporation. A for-profit or non-profit corporation operates the water system on behalf of the municipality. The municipality appoints the corporation's directors, with directors largely being persons with relevant

water experience. One example of this model is EPCOR, a City of Edmonton-owned for-profit corporation that offers water and electricity services. The City of Edmonton is the sole shareholder, and lays out the dividend policy, appoints the board of directors, and approves the auditors, while EPCOR has financial and managerial independence.

External Operating Agency. The municipal government has a contract with an external agency to manage its water, be it a private company, a provincial agency or another municipality. There are a number of examples of municipal governments contracting private operating agencies in Ontario. These agencies must be accredited and regulated, and the accountability tends to shift from the municipality to the private agency. An example of a municipal government contracting with a *provincial* agency is SaskWater, which operates like a commercial Crown corporation that provides water and wastewater services to municipal, industrial, government and domestic customers. Finally, one municipal government (typically a metro-adjacent municipality) can approach another municipal government (typically a larger city) to be the external agency managing its water. This type of arrangement can work for small municipalities that want to exchange direct local control for access to better and/or less expensive water services. The larger municipality can also benefit financially from the arrangement.

Regional Government. In many cases, when provincial governments establish regional governments to oversee large city-regions of numerous municipalities, regional water services are consolidated. The regional government treats water and sells it at a wholesale rate to the municipal governments, which in turn distribute it to consumers. The municipal governments then collect revenues from water rates. For example, the Greater Vancouver Regional District (GVRD) sells treated water to its member municipalities (which include the cities of Vancouver, Burnaby, Surrey, North Vancouver, and West Vancouver, among others).

IV. Why Share Water Services?

Regional water services may be as simple as a physical link for sending water from one municipality to another governed by an ad hoc agreement or as broad as shared responsibilities for water management such as joint ownership and/or operation.

Does it make sense for the large western cities to share water services with their smaller neighbours and pursue regional approaches to water management? Interviews with key informants revealed reasons both for and against sharing water services.

Reasons for sharing water services include financial benefit, geographic interdependence, public health concerns, regulatory changes, and public expectations.

Financial Benefit. Water services are expensive. It is assumed that efficiency can be improved and cost savings achieved through regionalizing water services and creating greater economies of scale. For some municipalities, there is an added incentive of increased revenue generated by a larger customer base.

Geographic Interdependence. In some instances, small communities may have problems with either water availability or water quality and would benefit from access to the water services of their larger neighbour. A large city, on the other hand, may want to provide water services to an adjacent community to avoid negative spillover effects (e.g., damage to the local watershed) linked to the smaller community.

Public Health Concerns. Problems with the safety and quality of a particular water supply (e.g., wells that are prone to contamination due to flooding) may be solved by connecting to a higher quality supply available in a neighbouring community.

Regulatory Changes. Partly due to the lessons learned from the Walkerton and North Battleford inquiries, many provincial governments have implemented more stringent drinking water quality guidelines and regulatory requirements regarding the treatment and monitoring of water. There is also proposed federal legislation regarding pollution prevention for ammonia and other toxic substances in wastewater effluent. Some smaller municipalities lack the resources to operate and maintain their water infrastructure to the new standards or may have financial difficulties implementing the new requirements.

Public Expectations. To the extent that sharing water services is seen by the public to improve water quality or make the system more efficient, pressure may be placed on municipal governments to share services.

While there are numerous pressures to develop regional systems, there are also a variety of challenges that delay or act as barriers to implementing service sharing arrangements or regional approaches including financial, political, licensing, policy, and environmental barriers. Some barriers are specific to water services, while others are applicable to inter-municipal service agreements in general.

Financial Barriers. One of the biggest barriers to implementing regional approaches is the fact that many small municipalities cannot afford the necessary infrastructure (e.g., a water pipeline). In addition, it is not always clear that a service extension will serve enough customers in the smaller community to make it cost-effective.

Political Barriers. Political barriers are a major impediment to regional services. There is often a history of non-cooperation and poor communication between municipalities, particularly between rural and urban municipalities. Barriers in the smaller communities include fears of annexation and loss of control over decision-making, convincing ratepayers of the value of sharing services and the perception that access to urban services will ruin the rural way of life by encouraging more growth. Barriers in the cities include the desire to keep economic development opportunities within city boundaries and concerns regarding the capacity of the city to meet the water needs of surrounding communities.

Licensing Barriers. Regional service arrangements must take into account the limits set by existing water licenses.

Policy Barriers. Regional service arrangements are often very complex and can involve different municipal policies. For instance, a policy prohibiting major utilities in highway right-of-ways can result in increased costs for rerouting. Internal municipal policies, such as those for growth containment, can also affect water service extensions. In some cases, a municipality may not have a formal policy on water extensions or regional services. As well, the land use policies of adjacent municipalities may not compliment city policies with respect to land use and development and water protection. To a certain extent there is a lack of overall regional planning around urban centres. For example, the Alberta Capital Region Wastewater Commission has no control or input regarding planning for new developments other than to provide the wastewater line as required. There is also the concern that by allowing regional water approaches (e.g., a water pipeline), "strip" developments will occur outside of city boundaries.

Environmental Barriers. Communities sharing the same system can have a negative effect on the hydrology of a region. Greater emphasis on urban water conservation could run counter to regional approaches that call for an increase in water use. Threats to existing water supplies and predictions about shrinking water availability may undermine support for sharing water services with neighbouring communities.

Overall, there are a number of factors encouraging the expansion of regional water services, and on the surface regional water service models often appear to be a straightforward solution to the water challenges of smaller communities. However, it is important to acknowledge that there are many barriers to regional service options. Difficulties with funding, conflicting policies, and non-cooperation among municipal governments are among the most difficult barriers. The point to stress is that while regional options are often a positive solution, regional models do not make sense in all circumstances.

V. Regional Water Management in Western Canada's Large Cities

The western cities vary in the degree to which they support water service extensions and utilize regional approaches.

Governance of Water Services. There are striking differences between the governance of water services being provided in Vancouver and Edmonton versus Calgary, Regina, Saskatoon and Winnipeg. The drinking and wastewater services in the latter cases are all run through municipal departments and tend to focus on water services within city limits.

A long history of regional governance of both drinking and wastewater utilities sets Vancouver apart from the other cities. The Greater Vancouver Water District is an agency designed to manage the watersheds of the region and is responsible for the supply and treatment of drinking water for the entire region, and the Greater Vancouver Sewerage and Drainage District manages wastewater governance on a regional basis. The GVRD Board makes decisions on regional water issues through the 35 elected officials that are appointed to the Board by the member municipalities.

Although Edmonton has a regional supply system for drinking water, it does not have Vancouver's two-tier governance structure. The City of Edmonton remains the sole shareholder in EPCOR, which is a municipal corporation. Water is one of the company's core businesses. As a business, it has extended its customer base into the surrounding region and sells water to regional water commissions and other municipalities. In this case, drinking water services are regional in that pipelines extend one-way out of Edmonton and into the surrounding area.

Water Service Extension Policy. In terms of drinking water, Vancouver and Edmonton are regional systems and therefore questions surrounding extension policies are not applicable. Calgary, Regina and Saskatoon all have policies in place regarding service extensions; the level of support for extending water services varies by city. Calgary has a formal policy supporting extensions to incorporated urban areas, but not for rural uses (exceptions are made in special cases). Regina will also extend services if the customer meets its conditions, especially those related to charges. Saskatoon has a written policy to sell its drinking water to SaskWater. Winnipeg does not have a policy and was awaiting the recommendations of the recently released Regional Planning Advisory Committee report *(A Partnership for the Future: Putting the Pieces Together in the Manitoba Capital Region)* prior to deciding how to formalize a service extension policy.

Wastewater service extensions are not a factor in Vancouver for the reasons noted above. Saskatoon and Winnipeg have no written policy on wastewater extensions, and Saskatoon only supports wastewater services within its municipal boundaries. Regina and Calgary have policies on extensions that are not unlike their drinking water service policies: they support extensions, but only under specific circumstances and with conditions attached. The City of Edmonton also supports the provision of wastewater services if specific conditions such as available capacity and operating costs are met.

The city-by-city account that follows on pages 9-14 offers more details on the drinking and wastewater systems,

governance and water service policies in each of the cities. There are some important areas of contrast in their water service policies, namely the degree to which each city supports water service extensions to adjacent municipalities. As well, there are varying levels of interaction with other municipalities. What is common is the municipal recognition of the importance of water services and the influence that availability and supply of water have on a region.

VI. Key Lessons

There is a degree of interdependency between large urban areas and their surrounding municipalities with respect to water services and approaches to water management. The interviews with key informants revealed several themes related to regional approaches to water services and a number of challenges and opportunities that are common to all the cities in the study.

Maintaining a safe and quality supply of water is a top priority. It was assumed by all key informants at both provincial and municipal levels of government that the safety of drinking water was a top priority. Human activity is placing greater stress on water systems and, as a result, there is a need for increased vigilance to protect the safety of drinking water and the health of watersheds. Municipalities will be challenged to attain more stringent standards for water and wastewater treatment as water sources becomes less pristine. An abiding concern for public health and safety may have an influence on decisions to share water services. For instance, it may be difficult to disregard a service sharing option if a municipality is experiencing problems maintaining the quality of its water. There is, moreover, significant public support for policies that seek to ensure that water is safe.

A regional approach to water services is the preferred option, but only in those instances where it makes economic sense to do so, brings health benefits to the region, and does not negatively affect the environment. The sharing of water services does occur in the western city-regions, with several regional or quasi-regional systems already in place around the large urban centres. Water and wastewater services benefit from a regional approach. The most common form of sharing involves linking of physical infrastructure such as tapping into existing water pipelines or building water pipeline extensions. Municipalities can also share intellectual infrastructure (e.g. through a central agency that makes decisions and coordinates management and operations of the physical infrastructure. By adopting regional water services, municipalities have the ability to coordinate the management of distribution and treatment across a larger system, implement common standards, and have a critical mass for expertise in operations and staffing.

Key informants felt that regional approaches were inherently better because they considered the entire region and thus create the potential for greater awareness of the watershed and water issues, upstream and downstream effects, and related challenges. Edmonton was typically cited as an example of a large-scale regional drinking water system that works. There are three conditions for regional approaches that should be met: that they provide mutual economic benefits for the municipalities involved; that they are done to prevent risks to public health; and that they do not negatively affect the environment. Risk analysis must always be factored in decisions regarding regional water services. For instance, if there is potential for environmental problems because water or wastewater services are not provided to an adjacent community, then this risk must be taken into account.

Provincial policies promote regional cooperation and water service sharing in municipalities and changing government regulations may necessitate the pursuit of regional options for smaller municipalities. All four provincial governments are supportive of regional approaches and water service sharing in various formats. For instance, in Alberta there is a

Vancouver

Watershed. Three watersheds supply the Greater Vancouver Regional District (GVRD): Capilano, Seymour and Coquitlam. These watersheds are mountainous and the snowmelt and streams flow to valley bottoms and feed three large supply lakes. The GVRD operates the Cleveland Dam located on the Capilano Reservoir at the south end of the Capilano Watershed in North Vancouver. This reservoir supplies 40% of the region's drinking water. The Seymour Reservoir is located in the North Shore Mountains and supplies 40% of the region's drinking water. Finally, the Coquitlam Dam and Reservoir are owned and operated by BC Hydro, which has an agreement with the GVRD to provide water from the reservoir. The reservoir supplies approximately 20% of the region's drinking water.

Governance. The Greater Vancouver Regional District is a partnership of 21 municipalities and one electoral area that make up the metropolitan area of Greater Vancouver. The GVRD's role is to deliver essential utility services, such as drinking water and wastewater treatment, and to protect and enhance the quality of life in the region by planning and managing growth and development. The Greater Vancouver Water District, a separate legal entity under the umbrella of the GVRD, manages the region's three watersheds and is responsible for the supply and treatment of drinking water. The Greater Vancouver Sewerage and Drainage District is also an agency of the GVRD that owns and operates the wastewater treatment plants and portions of the collection system on behalf of the member municipalities.

Drinking Water Management. The GVRD water system is one of the largest in North America and supplies approximately two million people. It is comprised of six dams, 22 distribution system reservoirs, 15 pump stations and more than 500 km of supply mains. Water is collected from three supply lakes and the watersheds in which they are located are closed to public access to protect them as a water source. Drinking water undergoes primary and secondary treatment (chlorine and ozone). After treatment, the water flows to the municipalities where each individual municipality is responsible for distributing the water to individual customers within its own municipal boundaries. Member municipalities purchase water from the GVRD at a wholesale rate (20 cents per 1,000 litres). Distribution to residential, industrial and commercial users is the responsibility of individual municipalities who are also responsible for setting the water rates charged to users.

Wastewater Management. One billion litres of wastewater are produced in the Greater Vancouver area every day. The GVRD manages wastewater by operating and maintaining the network of trunk sewers, pumping stations and treatment plants. As well, it regulates wastewater through legal regulations, such as permits, or through voluntary guidelines. Most of the wastewater in the region is treated at one of five treatment plants prior to being released. Two of the treatment plants provide primary treatment (mechanical) and the remaining three uses secondary treatment processes (biological).

The GVRD uses development cost charges to pay for wastewater services in new developments in the Lower Mainland such as new trunk lines, additional pumping stations, and expansion of wastewater treatment plants.
Although the City of Vancouver is responsible for stormwater management, the GVRD provides planning and operations services for two key watershed drainage areas and regional stormwater management policy and planning services to member municipalities as part of the region's Liquid Waste Management Plan.

Regional Policy. The City of Vancouver's water services operate within a regional system.

Calgary

Watershed. Calgary is situated on the Bow and Elbow Rivers, and takes water from both sources. With its headwaters in the Rocky Mountains, the Bow River is part of the South Saskatchewan River system that drains approximately 20% of Alberta. The Bow River, the largest tributary of the South Saskatchewan River, drains an area of about 25,000 km^2. The watershed covers an area of 7,770 km^2. The Elbow River is fed by the Elbow Valley watershed, which covers an area of 1,210 km^2.

Governance. Calgary's water system is managed through two municipal departments. For drinking water, the City of Calgary Waterworks operates and maintains the water system and supplies industrial, commercial and residential clients in Calgary and the region. Waterworks is run as a business unit of the City of Calgary and is financially self-supporting. For wastewater services, the City of Calgary Wastewater department plans, designs, constructs, operates and maintains two separate drainage systems – sanitary and storm. A group of 13 partners called the Calgary Regional Partnership is developing regional projects in the areas of municipal services, prosperity, and sustainable environments (including a watershed information management support system).

Drinking Water Management. Calgary Waterworks operates two water treatment plants – Bearspaw and Glenmore – as well as numerous pump stations and an underground pipe network. The Bearspaw Water Treatment Plant takes water from the Bow River and supplies the north sector of Calgary, while the Glenmore Reservoir on the Elbow River managed by the City supplies the Glenmore Water Treatment Plant for south Calgary. Both plants use conventional water treatment processes (coagulation, flocculation, sedimentation, filtration, and disinfection with free chlorine). Although the City reports that it does not have any short-term capacity issues, it does have some concerns about the effects of upstream activity (development and land use) on Calgary's drinking water quality. Due to increased nutrient and other contaminant loading, combined with more stringent treatment requirements, there is increased trends in chlorine demand, turbidity and fecal bacteria.

Wastewater Management. Wastewater is collected using a gravity system of underground pipes and lift stations. It is then treated at either the Bonnybrook or Fish Creek Wastewater Treatment Plants; a third plant, the Pine Creek Wastewater Treatment Plant, is currently being planned (the anticipated completion date is 2006). In addition to addressing Calgary's wastewater, Calgary Wastewater also services towns and developments outside of the Calgary city limits. Among the department's goals are reducing upstream risks to water supply, reducing downstream effects on the Bow and Elbow Rivers, and developing a long-term regional water and wastewater service strategy.

Calgary Wastewater is also responsible for stormwater management. The department's role has grown from just managing the storm drainage system to include improving stormwater quality. The system includes storm ponds (wet and dry), catch basins, an underground pipe network, and outfalls that direct the stormwater to creeks and rivers. The stormwater system operates by gravity. In conjunction with the Bow River Basin Council, Calgary Wastewater is planning to implement an urban stormwater plan, with the long-term goal of minimizing the effects of erosion and sediment on ecosystems including fish, fish habitat and other aquatic life. In addition, Calgary is reconstructing wetlands for stormwater management.

Regional Policy. The City of Calgary has a 1992 policy that supports the extension of water and/or wastewater services to existing incorporated urban centres (e.g., Chestermere) but generally not to rural users (residential or non-residential). The City will only consider the extension of services to rural areas to address environmental risks to the City's water supply or to users who must locate in rural areas due to specific requirements or special characteristics. The City has endorsed service connections to existing incorporated urban centres and single service connections to major industrial, recreational and tourism sites. The City has not approved any rural residential service connections.

One of the priorities of the Calgary City Council is to develop, in partnership with other communities, a long-term regional water and wastewater strategy. To date, the Municipal District of Rocky View and the City of Calgary have created a joint steering committee to work together to explore a wastewater and water service strategy for Bragg Creek.

The City of Calgary is concerned that providing urban water services to adjacent rural areas will encourage development that will undermine the City's ability to manage its long-term growth. By refusing water extensions to adjacent rural areas, the City hopes to ensure a clear separation of urban and rural land uses and to protect its long-term growth management options. The City is also concerned that some rural land uses could negatively affect urban quality of life and/or the environment.

Drinking water service extensions have been approved for the City of Airdrie, the Town of Chestermere, the Nexen and Calpine, and Spruce Meadows equestrian facility (restricted uses). Wastewater service extensions have been approved for the City of Airdrie, the Town of Chestermere, the Town of Cochrane, the Tsuu T'ina Nation, the Alberta Remand Centre, the Bearspaw/Glendale School and Recreation Centre, the Elbow Valley Joint Venture Utility, and the Nexen and Calpine power plants.

Edmonton

Watershed. Edmonton is situated on the North Saskatchewan River, and takes and returns water from that river. The source of the North Saskatchewan River is the Saskatchewan Glacier, 500 km southwest of Edmonton in the Rocky Mountains. The North Saskatchewan River Basin covers 28,000 km^2. It is part of the larger Saskatchewan River Basin that flows from the Rocky Mountains to Hudson's Bay and covers 432,000 km^2. The North Saskatchewan drains an area of about 12,800 km^2.

Governance. In 1997, the City of Edmonton transferred the ownership, operations and maintenance, and management of drinking water supply assets to EPCOR (which was incorporated as a separate legal entity in 1996). The City remains the sole shareholder of the corporation. An independent board of directors appointed by the City governs the company, which has seven core businesses including water services. Wastewater and stormwater operations remain under the direct control of the City of Edmonton's Asset Management and Public Works Department Drainage Services Branch.

Drinking Water Management. EPCOR Water Services supplies drinking water to the City of Edmonton and surrounding municipalities and water commissions. A total of 45 communities use water that is first treated at EPCOR's plants. The regional system around Edmonton consists of municipalities or water commissions providing water/wastewater services to various municipalities. This approach provides autonomy and controls at the local level. EPCOR has pipelines spanning 3,000 km, and operates two treatment plants: Rossdale and E.L. Smith. In addition to drinking water, EPCOR has an interest in source protection, and conducts annual environmental monitoring programs to report on the quality of lakes, creeks, river, storm sewer and combined sewer outfalls.

Wastewater Management. The City of Edmonton has a single wastewater treatment plant – the Gold Bar Waste Water Treatment Plant. Over the next five years the plant will undergo a major upgrade to further reduce the discharge of bacteria and nutrients by adding tertiary treatment. All City of Edmonton wastewater is treated at Gold Bar except for an area in northeast Edmonton whose wastewater is diverted to the Capital Region Sewage Treatment Plant. In exchange, the Gold Bar Plant treats wastewater from the Capital Region's southern members (Beaumont, Leduc, Nisku, and the International Airport). This agreement between the City of Edmonton and the Capital Region Sewage Commission has been in place since 1985.

A regional model for wastewater management is used, and the City of Edmonton is negotiating a master agreement with the Alberta Capital Region Wastewater Commission (ACRWC) pertaining to the efficient use of infrastructure. The City of Edmonton sets sewer rates, and there is a Regional Water Consumer Group (comprised of 13 members of the joint wastewater commission for drainage treatment areas) that coordinates water supply for 35-40 communities or commissions. Another group represents municipalities on operation and financial matters with EPCOR. Stormwater is discharged directly to North Saskatchewan River from more than 220 stormwater outfalls. The City has 50,000 catch basins that drain surface runoff from roads with 1,900 km of storm sewer pipe. The City uses wet ponds and constructed wetlands to manage stormwater runoff in communities; the runoff passes through stormwater management lakes prior to discharging to the river from the storm outfalls.

Regional Policy. Given that Edmonton already has regional servicing for drinking water, there is no strategy to extend the system. The City will provide wastewater services to customers outside of its boundaries if the following conditions are met: service capacity is available in the transmission and treatment system; the jurisdiction making the request supports the servicing proposal; the proponent will pay for all necessary capital investments and fees for system expansion; the proponent is responsible for operating costs of collection and transmission of wastewater to the City system; and the proponent will pay for transmission and treatment services as per City bylaws and rate schedules. These issues and conditions are quite similar to those considered for private development proposals within the city limits.

The ACRWC and the City are working on a regional services plan for sewer and wastewater transmission within the capital region because the current plant does not have capacity for expansion. Edmonton is in the process of developing a long-range assessment of the North Saskatchewan River (the primary receiving water) based on total loadings from all sources.

The City is open to supporting regional economic development and public health protection. However, it will not subsidize customers inside or outside of the city limits, nor will it compete for the customer base in the surrounding jurisdictions. By expecting the full cost of services to be covered, there is greater emphasis on economic disincentive to urban sprawl. Supporting watershed management may require additional financial support from other jurisdictions.

Edmonton has an agreement to share a trunk sewer line with the County of Strathcona (the 34th Street agreement). The County operates the line, and the City treats the sewage, provides bylaw inspection and generates the billing information. As previously mentioned, Edmonton has an agreement with the ACRWC for an exchange of sewage transmission and treatment services.

Regina

Watershed. Unlike the other four prairie cities, Regina is not situated on a major river. Regina is located within the large Nelson Watershed, which has its headwaters in Alberta and drains into Hudson's Bay. This large basin covers 1,093,442 km^2, encompasses three provinces and includes some of the longest rivers in Canada including the North and South Saskatchewan Rivers.

Governance. The City of Regina owns the Water and Sewer Service utility, which provides water, wastewater and drainage services to Regina.

Drinking Water Management. The City of Regina has two sources of drinking water: Buffalo Pound Lake and large wells. The primary source is Buffalo Pound Lake, which is a small (29 km) prairie lake located approximately 60 km away near the headwaters of the Qu'Appelle River in south central Saskatchewan. Water levels in the lake are regulated and controlled by the Saskatchewan Water Corporation and maintained by the release of water from the Qu'Appelle Dam on Lake Diefenbaker. The City of Regina and the City of Moose Jaw jointly own the Buffalo Pound Water Treatment Plant which provides drinking water to the City of Regina, Moose Jaw and some other rural communities and industrial users. The secondary source of drinking water is from wells around the Regina that are used in the summer during periods of high water demand, with the well water being mixed together with the Buffalo Pound Lake water. There is a 57 km pipeline from the Buffalo Pound Water Treatment Plant to the City of Regina, and the City has built a second larger pipeline to improve reliability, increase capacity, and minimize the future use of well water; the final 19 kilometers of this pipeline are being built in 2003. Regina has 750 km of water mains in the city limits and five treated water storage reservoirs that hold a total of about 160 million litres of water.

Wastewater Management. Wastewater is treated at the City of Regina Wastewater Treatment Plant. Wastewater flows through the system by gravity except in low-lying areas where lift stations are used. All wastewater flows to the McCarthy Boulevard Pumping Station that provides screening and transfer of wastewater to the treatment facility. The Wastewater Treatment Plant utilizes a four stage process: primary treatment to remove sand and organic material; secondary treatment to reduced dissolved organic material; tertiary treatment to remove phosphorus, algae and other suspended solids; and ultraviolet light to disinfect the water. The treated water is released into Wascana Creek. There are 35 wastewater customers outside the city limits.

The drainage system (stormwater) serves over 58,000 residential, institutional and commercial properties. The system is comprised of the underground drainage lines that collect and transport normal amounts of rainfall. When runoff water exceeds the capacity of the stormwater lines, other components of the system are used including dry bottom detention facilities (a temporary pond), underground detention tanks to store excess water temporarily, and storm channels and creeks. All the runoff via storm channels and underground system empties into Wascana Creek. Since 1992 Regina has been charging user fees based on estimated total property area for stormwater – the only major Canadian city to do so.

Regional Policy. Regina has a policy for sewer and water utility service outside the city limits. Most of the water services provided outside Regina are from supply mains (variable pressure and occasionally interrupted), but there are a small number of water services and sewer services connected directly to the City's water distribution and domestic sewer collection systems. All water and sewer services outside Regina are subject to a surcharge and sewer services are subject to a connection fee that reflects the capacity taken up by the service.

There is a regional economic development initiative, shared with the City of Moose Jaw, to promote the corridor between the two cities as a good industrial development area, well served with road, rail and air transportation, energy, power and water. Regina's main water supply pipeline provides the water. This regional initiative does not translate in to any special treatment under the City's water utility service policies.
City Council views its control of utility services as one of the few tools at its disposal to influence development outside Regina. But, Council is also committed to a regional approach to economic development.

The City has an agreement with Kronau (negotiated and approved but not built yet). SaskWater purchases water from the Buffalo Pound Water Administration Board and the City and distributes it to five communities and rural users. SaskWater also owns and operates a pipeline that connects with the City of Regina's pipeline from the treatment plant and delivers water to the Village of Grand Coulee. There is also a number of wastewater customers located outside of the city limits that have service sharing arrangements with the City, for instance, the corrections centre, which is small and in close in proximity.

Saskatoon

Watershed. Saskatoon is located on the South Saskatchewan River, which is part of the Saskatchewan River Basin. The basin covers 420,000 km^2. The Saskatchewan River is Canada's fourth longest river. The South Saskatchewan River's headwaters arise from seven small rivers flowing from the Great Divide in Montana and southern Alberta. These rivers merge, and between the cities of Lethbridge and Medicine Hat, the South Saskatchewan first appears at the junction of the Oldman and Bow Rivers. It then widens into Lake Diefenbaker and angles north past Saskatoon where it meets with the North Saskatchewan River.

Governance. The Water Treatment and Meters Branch and the Wastewater Treatment Branch are civic departments within the City of Saskatoon's Utility Service Department. As well, the Water and Sewer Section of the Infrastructure Service Department provides planning, design, and project management services for the City's water distribution, sanitary sewerage collection and stormwater collection.

Drinking Water Management. Water is taken directly from the South Saskatchewan River via intakes at the Queen Elizabeth Power Station. It is then screened and pumped to the Water Treatment Plant using City-owned pumps. Over 213,600 customers in Saskatoon and the surrounding area are served by Saskatoon's drinking water in addition to various commercial and industrial customers. Water is also supplied to the SaskWater Corporation (SaskWater is a provincial Crown corporation that provides water and wastewater services to Saskatchewan communities) to serve water users outside the City's boundaries.

Water is disinfected through a series of treatment steps that include screening, chlorination, rapid sand filtration and the final addition of ammonia hydroxide to preserve water quality. Over 21,000 tests are carried out every year to ensure good water quality. Once treatment is complete water is distributed to three reservoirs and then on to individual customers. The City is currently in the initial phases of increasing the capacity of the water treatment plant. The plant will be expanded to meet the needs of the City to the year 2040 without moving to a water conservation program.

Wastewater Management. The City has been treating its sewage since 1971 when the H. McIvor Weir Wastewater Treatment Plant was built. The City uses a secondary sewage treatment process that uses bacteria to remove carbon, phosphorous and nitrogen. Prior to discharging the effluent into the South Saskatchewan River, it is treated with chlorine. In order to meet Saskatchewan Environment's updated water regulations, a new $13 million water treatment system is planned that will redirect the sludge floating in the South Saskatchewan River to the local landfill. The City will pay over $10 million of the cost. The City's stormwater collection system is direct into sewers with discharge into the South Saskatchewan River.

Regional Policy. The City has adopted a policy of selling treated water to SaskWater, which then re-sells it to surrounding communities. The only exception to the SaskWater delivery model is a long-standing agreement between the City of Saskatoon and the Jewish Cemetery whereby the City sells the cemetery water directly for irrigation. The City sells its drinking water to SaskWater through the Master Water Supply Agreement and City Policy C09-018 (Potable Waterline Connections). As well, any landowner outside of the city limits can apply for a connection to an existing pipeline of the City's water distribution system. The City feels there are two advantages to having SaskWater distribute its water to adjacent communities: the administration costs to the City are lower than if the City were to manage multiple agreements and it encourages a regional approach to water management. SaskWater is considering whether it is more cost effective to purchase water from the City and pipe it to more distant communities or to build a SaskWater treatment plant at a strategic location to supply customers in the surrounding region.

The purpose of the current City policy on Potable Waterline Connections is: to restrict ribbon growth along pipelines outside of the City and prohibit growth of subdivisions; to provide drinking water to surrounding towns and villages but to limit the supply area to within their corporate boundaries; to encourage farmers to use City water, but discourage those whose land does not abut the waterline; and to discourage commercial or industrial growth outside the city limits if land is available within the city limits.

The City does not provide wastewater services to businesses or residents in surrounding municipalities on the grounds that if these areas require the services they should be annexed and pay property taxes. A recent example of this is the land adjacent to the Willows Golf Course, which was annexed to allow for a potential community to be developed around the golf course. The City feels that this position is necessary to ensure growth and expansion of the City. At the same time there are some concerns with perceived inadequacies in sewage treatment in some of the growing rural municipalities and the influence that this may have on Saskatoon's drinking water.

Winnipeg

Watershed. The Red River joins with the Assiniboine River at Winnipeg and then drains into Lake Winnipeg at its southern end. Water from Lake Winnipeg eventually flows into Hudson Bay and so Winnipeg is situated at the juncture of several sub-drainage basins. Lake Winnipeg receives drainage from nearly 1,000,000 km^2 extending to the Rocky Mountains in Alberta, large portions of North Dakota and Minnesota to the south, and a portion of northwestern Ontario to the east. Winnipeg's drinking water is obtained from Shoal Lake, which is located on the border between Manitoba and Ontario.

Governance. Winnipeg's Water and Waste Department is a large civic department consisting of three distinct "utilities" - water, wastewater and solid waste disposal. The Department also provides tax-supported services for land drainage, flood control and solid waste collection. City Council has final authority to set water and sewer rates and approves by-law amendments for changes to department services. It derives its legal mandate from *The City of Winnipeg Act*.

Drinking Water Management. Water flows from Shoal Lake to Winnipeg by gravity through a 160 km long aqueduct and is then stored in Deacon Reservoir. The reservoir holds 8,400 million litres, which is enough water to supply the current population of Winnipeg for 28 days. This reservoir also supplies water to three smaller reservoirs and pumping stations in Winnipeg. Chlorine is added to the water as a disinfectant at three different places - Shoal Lake, Deacon Reservoir, and the various pumping stations. Shoal Lake covers 227 km^2 and contains 2.64 billion cubic metres of water. Winnipeg is licensed to take up to 455 million litres of water per day from the lake. Management of Winnipeg's drinking water involves working with First Nations on Shoal Lake, the federal government and the provincial governments of Ontario and Manitoba. Until recently the water quality was high enough that no treatment was required except for the addition of chlorine and fluoride. New changes to water quality requirements mean that the water will not meet current standards. As a result, the City has approved the construction of a new water treatment plant to be operating by 2006. The surrounding region has particular problems with drinking and wastewater specific to its geography. The clay soils of the Red River Valley are not particularly suitable for traditional septic fields. As well, it is estimated that there are almost 24,000 wells in the region. In some cases, the quality of the water has deteriorated because some of the aquifer west of the Red River contains salt water and the boundary between salt water and fresh water has been moving east over the years.

Wastewater Management. The City treats sewage at three Water Pollution Control Centres - North End, West End, and South End. The quality of water in the Red River, Assiniboine River and Lake Winnipeg is affected by the way the City collects and treats sewage and manages land drainage. In some areas of Winnipeg, both rainwater runoff and wastewater (sewage from residences and businesses) are collected in the same sewer pipes (referred to as combined sewers). There are 1,296 km of wastewater sewers and 2,165 km of storm sewers. As well, there are 1,320 km of combined sewers servicing approximately 30% of Winnipeg. If there are large volumes (usually due to heavy runoff from rainstorms), combined sewer overflow occurs and the sewage flows directly into the rivers without being treated. Since 1960 all new subdivisions have been built with separate sewer systems where wastewater and stormwater are collected in separate pipes.

A study was done in 1994 to understand the effects of overflows on river quality and develop options and costs to control the overflows. The City has implemented upgrades, undertaken further studies and prepared plans to improve its systems. A pollution prevention proposal recommends modifications to the sewer system to create temporary sewer system storage in order to reduce overflow events - this improvement is staged over 50 years at a cost of $271 million.

One of the city's wastewater treatment plants does not have effluent disinfection and, as a result, is not able to meet provincial standards for the levels of effluent being released into the river. Ultraviolet disinfection technology will be implemented at this plant in 2005 and improvements are planned at the other plants.

Regional Policy. The City does not have a policy at this time, but is planning to prepare one based on the results of the provincial government's Regional Planning Advisory Committee report that was released in the fall of 2003. The Water and Waste Department is in favour of regional services, but considers it is a planning and land use issue, not an engineering issue. In the early 1990s, Council turned down a proposal to supply water and sewer services to a neighbouring municipality. The Province supplied the municipality with the services through the Manitoba Water Services Board. The City is concerned that providing water and sewer services to adjacent municipalities will encourage growth outside the City, particularly given that the adjacent municipalities have lower property taxes. According to the City, there are planning, policy, financial, regional and environmental implications to consider before any potential extensions.

Examples of Provincial Policies and Programs in Support of Urban Water Service Sharing

British Columbia

The provincial government affirms that it may be necessary for smaller system operators to either pool their resources or consider other options like amalgamation with larger systems to meet the requirements of new legislation.

Alberta

Grant programs are available to fund regional water pipelines (to a maximum of 75%), especially in cases where finances are an issue and the lack of regional services pose a threat to the environment and/or public health.

One of the objectives of the proposed Provincial Water Strategy is the promotion of regional water services. The province wants municipalities to give serious consideration to public-private partnerships, regional systems, and the contracting out of operations and maintenance.

Regional staff promote regional services in cases where upgrading of existing infrastructure is necessary or where rural conditions require servicing.

Environmental impact assessments for water service extensions between municipalities are not required.

Saskatchewan

Saskatchewan's Water Management Framework focuses on ensuring safe drinking water, encouraging partnerships among all levels of government to implement water management solutions, and examining full-cost pricing for water. The provincial water strategy contains new requirements for water plants to have certified operators. This indirectly encourages regional approaches to sharing water services personnel.

SaskWater owns and operates regional water supply systems and facilitates the development of municipal and regional water utilities.

Sask Landing Water Pipeline Group (towns and rural municipalities in the central area of the province), Entrepreneurs 2000 REDA Inc., the Prairie Farm Rehabilitation Administration, and SaskWater initiated a study to determine the feasibility of bringing large volumes of water from Lake Diefenbaker to the central region. The proposed pipeline would create a long-term water source and allow for future development and create sustainable rural communities.

Manitoba

Manitoba Water Services Board (MWSB) encourages regional service delivery. The Board's commitment to helping municipalities find the "best sustainable option" takes into account engineering feasibility, legal requirements, capital and operating costs, and development plans for the area and the unique requirements of the community. The Water Services Board has a grant assistance program for water infrastructure and regional arrangements (provincial-municipal cost sharing).

proposal to facilitate regional water and wastewater services by replacing an onerous approval process with a more streamlined registration process. Provincial and federal infrastructure funding programs are also supportive of sharing water infrastructure.

Provincial policies and regulations are significantly more onerous than in the past because of recent incidents involving water safety. The costs associated with developing and maintaining systems to achieve these evolving regulations can be significant and place significant pressure on municipal governments. Smaller communities may not be able to meet new provincial water quality regulations and requirements, which may force them to look at other options such as pooling their resources or considering amalgamations with larger systems. As well, Environment Canada's new guidelines for levels of ammonia and chlorine will be implemented as a standard blanket guideline across Canada. This means that wastewater treatment plants will have to be upgraded to meet the new standards. Small communities may have financial difficulty upgrading their infrastructure. Some key informants noted the lack of provincial policies to support the cost increases needed to meet the new standards.

Many municipalities face serious challenges with respect to infrastructure costs and the financing of water services. One of the key challenges faced by municipalities is funding infrastructure and water-related infrastructure is no exception. Recent research by the Canada West Foundation and others indicates that there is a large infrastructure deficit in Canadian municipalities. According to one respondent, "it makes sense to share services that necessitate substantial capital expenditures of public money."

The magnitude of financial support provided by provincial governments for water services is a contentious topic. Some key informants suggested that the provinces need to provide more technical and financial resources, especially to smaller communities given their limited capacity in these areas. However, in recent years, water system operators, consulting engineers and government representatives have become more vocal in urging municipalities to charge rates high enough to cover the costs of maintaining their water systems.

There is a significant connection between land use planning and development and water service extensions. Land development and water policies between the urban centre and surrounding municipalities were perceived to be generally compatible and supported. It was noted that, although bylaws in surrounding communities are compatible, enforcement capabilities were not as strong or consistent. As well, there can be differences in planning or zoning especially in relation to environmental sensitivities. For instance, one municipality may have measures that recognize the sensitivities around an aquifer, while another may not. Many key informants felt that urban water service policies are able to direct or dissuade the nature of development in adjacent municipalities. For example, there were strong concerns expressed regarding the densification of adjacent rural areas and municipal governments may not want to encourage development outside of the city's jurisdiction. At the other end of the spectrum, some key informants felt that municipal land use planning might indirectly be setting up a system that encourages extending water services to adjacent developments.

Unfortunately, for many growing communities, rural subdivision planning and country residential development are not linked to the preservation of watersheds. Human activity and growth place pressures on water resources, such as increasing water withdrawals, loss of habitat, removal of vegetation, increased runoff and destabilization of stream banks, and pollution. Municipal governments subscribe to the notion of environmental protection and preservation, but they may have difficulty implementing

policies that that would either create impediments to development or force land developers to accept a reduced return on investment. Since land development is good for a city's economy, it can override a municipality's stance on environmental issues or conservation planning. Without some form of regional planning, ad hoc development will continue to be detrimental to the larger watershed.

Economic feasibility, public health, and environmental effects need to be considered when making service sharing decisions that affect the larger region. Decisions regarding service sharing are often made in an ad hoc manner without a proper mechanism for balancing economic, health and environmental considerations. In many instances, water services are run as a utility that is set up to generate revenue that is then used to pay for other municipal activities. Regional approaches may make economic sense because selling service to other customers can increase revenues for the supplying municipality. Some key informants viewed this business-oriented perspective on water services management as very positive. If water services were conceptualized as a business venture and separated from urban sprawl issues, regional approaches to service delivery could proceed more smoothly. Alternatively, a municipality could decide to run water services as a utility, but only as a self-financing utility – not one that generates revenue.

Key informants also pointed out that water is intrinsically linked to public health. Solutions that ensure safe water supplies and meet health standards must also take into consideration the economic effects on communities.

Finally, large urban centres are keenly aware of sustainability and protection of the environment and thus the quality of life for residents. Changes to water systems, building pipelines, and transfers of water between water basins all place pressures on the environment. As demand increases, the effects extend to watersheds, drainage areas, and the overall capacity of the water source.

Stormwater management is linked with regional approaches to watershed management. Stormwater is precipitation that runs off into waterways rather than soaking into the ground. In the past, the major objective of urban stormwater drainage systems was to divert the stormwater away from streets and basements as quickly as possible and discharge it directly into local bodies of water. However, it has become clear that the volume and quality of urban stormwater have a major impact on streams, rivers, and lakes that demands new approaches to urban stormwater management.

Initial stormwater management mechanisms included the construction and maintenance of physical drainage and flood control. This has evolved to include protection of water quality, establishment of best management practices, and the administration of credits and user fees for stormwater retention. Unfortunately the focus of large cities has not always been to advance best practices in stormwater management. Calls to effectively address stormwater quality within jurisdictions and throughout the region have translated into costs associated with its management. One of the preferred options for managing stormwater is a coordinated watershed level approach, where responsibilities include watershed quality and move away from public works managed stormwater structures.

Stormwater planning needs to be integrated with land use planning efforts because of links between the amount of the land being developed (e.g., paved-over) and water drainage. The watershed can only handle a certain amount of impervious surfaces before the quality of the water is negatively affected. It was noted that intergovernmental cooperation is vital to make these types of planning efforts work.

There is a need for broader, system-wide perspectives concerning watershed management and planning. Key informants expressed a great deal of concern about the need for a coordinated approach and a system-wide

perspective to address issues that affect the function of the watershed including protection, restoration, and management. Watershed planning considers the management of the watershed as an integral whole and would encompass existing and future land use, allocation and use of water, the natural environment, prevention of potential problems and reduction of negative environmental effects, taking responsibility for the watershed, and consideration of the long-term health of the watershed. Coordinating regional plans and implementing solutions across jurisdictions would assist with watershed planning.

In several instances, provincial water strategies propose to build upon existing watershed protection groups that are often made up of local stakeholders including municipalities. Protecting watersheds will result in improvements in water quality for both urban and rural water systems, yet with the exception of Vancouver, it is still in its infancy across western Canada. Protection of drinking water sources can be jurisdictionally complicated when a municipal water supply source is not within that municipality's boundaries. In the current policy environment, one municipality may be reliant on another municipality, the provincial government and/or other stakeholders for improvements in the quality of the water source. It is unclear who would bear the brunt of responsibilities and potential financial burdens for increased emphasis on source protection. These responsibilities could include increased monitoring, reporting, and implementation and enforcement of source protection measures such as improved livestock watering practices.

Although regional approaches are positive, sharing physical infrastructure for water does not address the need for long-term solutions for sustainable water management (e.g., water conservation). Service sharing may solve water quality and supply problems for metro-adjacent communities, but governments should be aware that regional approaches could mask other challenges facing watersheds and the environment.

What lessons can be drawn from this specific examination of large western cities? Despite the differences among the western cities, to varying degrees all were proponents of regional approaches to water services. In general, recognizing the need to think of water beyond municipal boundaries and ways to better manage water in a fractured system was spoken about frequently. There is a need to increase the connectivity among stakeholders and to strive for implementing promising practices. Due to the unique nature of city-regions and watersheds, best practices may not be applicable system-wide, but could be tailored to fit with circumstances.

VII. Recommendations

Managing the distribution of water and wastewater services among municipalities has emerged as a major public policy challenge. Getting these relationships right is a critical component of effective and fair urban water management. Based on the research findings, the following recommendations emerge:

1. Large cities should be open to exploring the development of shared water services. The sharing of water services has the potential to improve the quality of drinking water available in smaller centres and rural areas, to boost economic development prospects in those same areas, to enhance control over, and the effectiveness of, the maintenance of regional watersheds, and to improve the cost-effectiveness of city water services by expanding the markets they serve. The benefits of shared services, however, must be weighed against the potential disadvantages. The value of sharing water services should, therefore, be evaluated on a case-by-case basis.

2. Ensuring the safety of drinking water in all communities should be viewed as a shared responsibility. If large cities can assist smaller centres and rural residents to ensure the safety of their drinking water

through cooperative arrangements, they should do so. Helping to ensure the health of all Canadians regardless of where they live should be a key concern of every municipality's water policy.

3. Water service sharing agreements should fully account for the environmental effects of changing the water distribution system. Protecting watersheds, habitat and other environmental considerations should not be trumped by short-term considerations or narrow thinking.

4. Water service sharing agreements should take into account the full cost of the services in question including the long-term replacement of infrastructure and maintenance of the environment that is the source of the water. Communities that benefit from the water services of another community should contribute to the maintenance of the system over the long-term. More information regarding the true cost of maintaining a high quality and sustainable water supply is needed to inform policy in this area.

5. Mechanisms for managing the demand for water should be built into water service sharing agreements. For a range of reasons, water conservation is important to the long-term sustainability of the water supply. Every effort should, therefore, be taken to ensure that all parties involved in a water sharing arrangement respect this goal and commit to concrete steps to achieve it. Decision-makers must endorse the idea that conservation is a higher priority than generating revenue from increased sales of water by municipal utilities. Similarly, utility operators must be able to encourage conservation without undermining their ability to fund their operations.

6. Given the complexity of managing water sharing, municipalities should develop formal structures to facilitate communication and decision-making among stakeholders including governments, business, nonprofit organizations, and the public.

7. Provincial governments have an interest in ensuring an adequate supply of high quality water to all residents. Hence, in cases where there are clear advantages to water sharing, but inadequate local resources to make it happen, provincial governments should provide financial and technical assistance.

8. Water management and land use planning should occur at both an integrated local level and at the larger regional or watershed level. There is a need for greater integration among land use policy and water policy. There is also a need for a system-wide perspective in water management. At the local level, adjacent municipalities should be working together to find the best solutions for managing water because it transcends municipal boundaries. The actions of all municipalities within a watershed, either good or bad, are felt by neighbouring jurisdictions.

VIII. Conclusion

Despite the need for safe, reliable and sustainable water systems, water services management is not typically seen as a top priority on the urban policy agenda. While some may read this reality as a statement of satisfaction with current water management systems – there are no immediate crises, so therefore everything must be fine – water services deserve considerably greater political and public priority. Urban water services management is an area of considerable complexity, and there is good reason to believe that this complexity will only grow in the years and decades ahead.

There is increasing need for municipalities to actively balance economic, public health and environmental interests – both within the large cities and between the large cities and their neighbouring municipalities. Municipal

governments that fail to find this balance put their community's financial well-being, public health and long-term environmental quality at risk. This points to the need to consider regional approaches to water services and watershed management.

With the exception of Vancouver and Edmonton, the western cities are currently using regional water management approaches in a limited way. Regional solutions are used occasionally, but typically in an ad hoc manner. Municipalities are aware that water is not simply a local issue, but do not always have the policies or formal bodies in place to ensure coordinated approaches. This is true despite the fact that municipal officials are aware of the value of regional models, and western provincial governments have policies in place to facilitate increased regional water services.

What can explain this disconnect between understanding of the larger issues and municipal policy action? The answer is that while there are a number of pressures for, and benefits to, expanding regional water service approaches, there are also considerable political, economic and other barriers that must be considered and addressed. Indeed, it would be incorrect to argue that regional water service models are appropriate in each and every situation. The task for the large cities is to work with neighbouring municipalities and other stakeholders to evaluate a number of criteria – cost, proximity, sustainability, and growth – to assess the value of regional serving options for their communities and watersheds. In some instances, it may be more appropriate for municipal governments to identify short-term models for coordinated water service management, rather than sharing water services.

The key conclusion of Regional Water Works is that western Canada's large cities have significant influence over the watersheds in which they are situated, and therefore a responsibility to work with other municipalities situated in the watershed to ensure proper watershed stewardship. Urban water services need to be viewed in a balanced perspective, with consideration of economic, public health and environmental interests. The large cities must work actively with their neighbours to protect and preserve the quality and availability of water for future generations. It is in everyone's interest to do so.

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